

Study Guide and Intervention

Isosceles and Equilateral Triangles

Properties of Isosceles Triangles An **isosceles triangle** has two congruent sides called the **legs**. The angle formed by the legs is called the **vertex angle**. The other two angles are called **base angles**. You can prove a theorem and its converse about isosceles triangles.

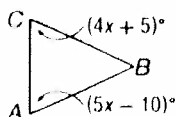
- If two sides of a triangle are congruent, then the angles opposite those sides are congruent. (**Isosceles Triangle Theorem**)
- If two angles of a triangle are congruent, then the sides opposite those angles are congruent. (**Converse of Isosceles Triangle Theorem**)



If $\overline{AB} \cong \overline{AC}$, then $\angle B \cong \angle C$.

If $\angle B \cong \angle C$, then $\overline{AB} \cong \overline{AC}$.

Example 1 Find x , given $\overline{BC} \cong \overline{BA}$.



$BC = BA$, so

$$m\angle A = m\angle C$$

$$5x - 10 = 4x + 5$$

$$x - 10 = 5$$

$$x = 15$$

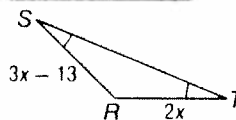
Isos. Triangle Theorem

Substitution

subtract $4x$ from each side.

Add 10 to each side.

Example 2 Find x .



$m\angle S = m\angle T$, so

$$SR = TR$$

$$3x - 13 = 2x$$

$$3x = 2x + 13$$

$$x = 13$$

Converse of Isos. \triangle Thm.

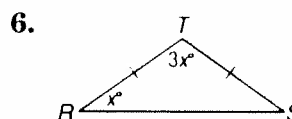
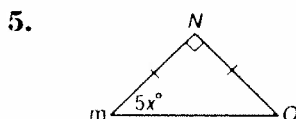
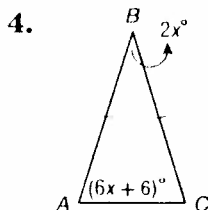
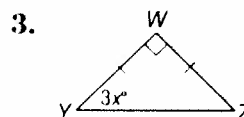
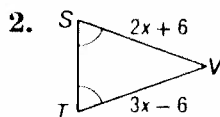
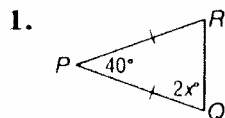
Substitution

Add 13 to each side.

Subtract $2x$ from each side.

Exercises

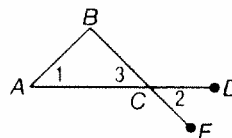
ALGEBRA Find the value of each variable.



7. PROOF Write a two-column proof.

Given: $\angle 1 \cong \angle 2$

Prove: $\overline{AB} \cong \overline{CB}$



Study Guide and Intervention *(continued)*

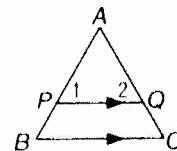
Isosceles and Equilateral Triangles

Properties of Equilateral Triangles An equilateral triangle has three congruent sides. The Isosceles Triangle Theorem leads to two corollaries about equilateral triangles.

1. A triangle is equilateral if and only if it is equiangular.
2. Each angle of an equilateral triangle measures 60° .

Example Prove that if a line is parallel to one side of an equilateral triangle, then it forms another equilateral triangle.

Proof:

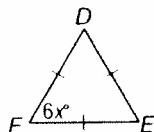


Statements	Reasons
1. $\triangle ABC$ is equilateral; $\overline{PQ} \parallel \overline{BC}$.	1. Given
2. $m\angle A = m\angle B = m\angle C = 60$	2. Each \angle of an equilateral \triangle measures 60° .
3. $\angle 1 \cong \angle B$, $\angle 2 \cong \angle C$	3. If \parallel lines, then corres. \angle are \cong .
4. $m\angle 1 = 60$, $m\angle 2 = 60$	4. Substitution
5. $\triangle APQ$ is equilateral.	5. If a \triangle is equiangular, then it is equilateral.

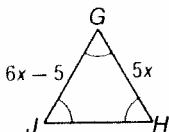
Exercises

ALGEBRA Find the value of each variable.

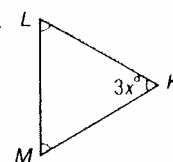
1.



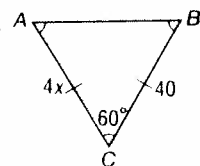
2.



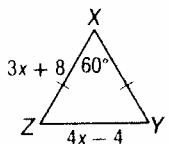
3.



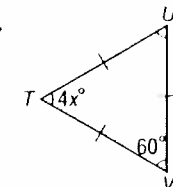
4.



5.



6.



7. PROOF Write a two-column proof.

Given: $\triangle ABC$ is equilateral; $\angle 1 \cong \angle 2$.

Prove: $\angle ADB \cong \angle CDB$

